

BIO 2011/2011L | Ecological and Evolutionary Systems | SP 2023

4 Units: 3 hours of lecture + 3 hours of lab, weekly

Lectures: Mondays, Wednesdays, and Fridays | 1:30 – 2:25 pm | Latter Hall 01

Labs: Thursdays | 8:00 – 11:00 am (Sec. 1), 1:30 – 4:30 pm (Sec. 2), 5:30 – 8:30 pm (Sec. 3) | Rohr Science 40

Instructors:

Dr. Andrew Nosal (he/him/él) | anosal@pointloma.edu | 619-849-2656 | Rohr Science 140

Prof. Jennifer Niethammer | jnietham@pointloma.edu

Office Hours:

Dr. Nosal: Mondays, Wednesdays, & Fridays, 9:00 am – 10:00 am | Rohr Science 140, and by appointment

Prof. Niethammer: Thursdays, 5:00 pm – 5:30 pm | Rohr Science 40, and by appointment on Zoom

Final Exam: Friday, May 5, 2023 | 1:30 – 4:00 pm | Latter Hall 01

Course Description

This course provides an introduction to the principles of ecology, evolutionary biology, and sustainability. Evolution is the unifying theme for all of biology; it encompasses all subdisciplines, from development to medicine to conservation biology. Ecology, on the other hand, helps us to understand and sustain the delicate balance between the living and nonliving world. The introduction to the study of evolutionary processes will include the basic mechanisms for evolution, the theory of natural selection, the basis of heredity and variation, population structure and genetics, and mechanisms of speciation. Along with these topics we will explore the ways that questions about evolution are answered, and how some Christians reconcile their faith with their acceptance of evolution. The introduction to the study of ecological systems will include an examination of both biotic (living) and abiotic (non-living) elements of the environment that influence the distribution and abundance of organisms. Population, community, and ecosystem level ecology are addressed, especially in light of humans' influence on nature and nature's influence on humans. We will then discuss how we can apply ecological principles to species conservation and consider our responsibility to care for God's creation through sustainability. Our hope is that you develop an appreciation for the complexity and beauty of living systems, and develop awe and respect for the Creator through study of His creation. An inquiry-based laboratory (BIO 2011L) is a co-requisite for BIO 2011.

Course Learning Outcomes

By the end of this course, students will be able to:

1. Assess the status of modern evidence for the theory of biological evolution as an explanation for the diversity, commonalities, and ancestry of living organisms.
2. Articulate the relationship between scientific understandings of evolution and Christian concepts of creation.
3. Describe how interactions between organisms and their environment influence populations, communities, and ecosystems.
4. Develop and defend a position (worldview) on environmental stewardship.
5. Design and conduct an independent investigation applying the processes and tools of scientific inquiry (both hypothesis testing and discovery science) to test biological hypotheses.
6. Prepare and analyze graphs drawing valid scientific conclusions.

Foundational Explorations Learning Outcomes (FELO)

Foundational Exploration (FE) courses are required to assess a FELO. In this course, we will assess FELO 1D: **Critical Thinking** – “Students will be able to examine, critique and synthesize information in order to arrive at reasoned conclusions.” This FELO will be assessed by means of a few questions embedded into the final exam.

Course Credit Hour Information

In the interest of providing sufficient time to accomplish the stated Course Learning Outcomes, this class meets the PLNU credit hour policy for a 4-unit class delivered over 15 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 150 total hours meeting the course learning outcomes.

Textbooks, Readings, and Other Materials

Required Equipment:

iClicker2 remote (see below for more information)

Personal computer (with a camera and reliable internet service)

Required Texts:

Principles of Biology (Third Edition), by Brooker et al. (ISBN 97891260708325)

Origins, by Haarsma & Haarsma (ISBN 9781592555734)

Supplementary readings and videos may also be assigned; these will be posted on Canvas or e-mailed.

Important iClicker Information

I will be using iClicker to make our class time more engaging. This will show me what you know, give everyone a chance to participate, and increase how much you learn in class. This will also provide you with feedback on how well you are comprehending course concepts and help you master challenging concepts. Participating in my iClicker activities will also be used to record attendance (see attendance and participation policy below).

You are required to bring an iClicker2 remote to participation in activities during every class period. It is your responsibility to follow the steps below to properly register your iClicker2 remote in a timely fashion. In order to participate in my iClicker activities and ensure that your grades are properly reflected in the gradebook, please follow the steps below:

1. Purchase (new or used) or rent an iClicker2 remote from the PLNU Bookstore, Amazon, or Macmillian Learning websites, among others.
2. Register your remote online. Visit <https://www.iclicker.com/remote-registration-form-for-classic> and complete the registration form. Enter your Canvas username (the part of your PLNU email address before the @ symbol) in the “Student ID” field. You will also need the [8 digit alphanumeric remote ID on your iClicker remote](#). Please note that if you have a used iClicker2 remote, you may need to pay a one-time registration fee.
3. Bring your remote to each class period. Make sure your remote frequency is set to “AA” (the default). When I ask a multiple-choice question, use your remote to respond.

Academic Integrity Information:

iClicker activities fall under the provisions of our campus academic honesty policy. Students must not engage in academic dishonesty while participating in iClicker activities. This includes but is not limited to:

- Answering polling questions while not physically in class
- Looking at other students' devices while answering live questions
- Using more than one iClicker remote or account at a time

Violation of these rules will be handled according the the PLNU Academic Honesty Policy (see below).

Course Format

This course consists of highly interactive 'lecture' sessions that will employ team-based pedagogy. Students are expected to come to class prepared, ready to participate in classroom activities. 'Lecture' sessions will regularly consist of class discussions, PowerPoint presentations, iClicker questions, board work, videos, breakout groups, and student sharing. A co-requisite laboratory session will use the same team-based pedagogy to apply concepts learned in 'lecture' to real-world situations.

Your Expectations of Me

My goal is to maintain a warm and inclusive learning environment. Teaching and learning are inherently interactive and thus social and emotional; thus, I will never intentionally intimidate or embarrass you. Instead, I will try to challenge, empower, and inspire you. I will be friendly, fun, and approachable, but never at the expense of integrity, thoroughness, and fairness. I invite your questions and challenges (I make mistakes too) whenever they arise. In addition to your teacher, I am also your mentor and advocate; feel free to approach me with any question or concern about this class or otherwise. I am committed to mastery of the material I am teaching, to punctuality, accountability, organization, and preparedness. I will have assignments and exams graded and e-mails answered in short order, and I will make myself as available to students as possible.

My Expectations of You

I expect you to attend every lecture and lab session, arriving slightly *early* so we can begin on time. You should arrive prepared, having completed any assignments due as well as the scheduled readings. I expect a certain decorum in the classroom. Please respect your fellow students and me, as I will respect you. Your cell phones should be turned off or silenced and put away (out of sight, out of your hands) during class, unless you have prior approval from me (e.g., you have a child in daycare, a relative in hospice, etc.).

To succeed in this course, you must attend every lecture and lab, complete all assigned readings by their due date, and submit assignments on time. When completing assigned readings, read *actively* and *do not ignore the figures*. That means not merely skimming and/or highlighting. Reading actively means taking notes and drawing concept maps while reading and developing insightful questions you can bring to class. Most importantly, **COME TO OFFICE HOURS EARLY AND OFTEN!** I love helping students and office hours are perfect for me to work with you individually or in small groups. Coming to office hours early and often is bound to improve your grade! I am personally invested in your success; however, you must be proactive and seek out help as needed. You must take ownership of your education! Lastly, use this general rule of thumb to self-assess your learning: if you truly understand the material, you should be able to teach it (explain it) clearly and concisely to another student.

I prefer that you take notes by hand, as several recent studies have shown that handwriting notes improves learning and retention over typing notes on a computer. One reason is that using your computer can be distracting,

with countless temptations to engage with social media, e-mail, etc. The other reason is that handwriting notes is slower, which means you must actively distill in real time the lecture material to the most important points. This vital processing step is lost when you type notes because you can probably type fast enough to write every word being said. Nevertheless, if, for whatever reasons, you feel typing your notes in class works best for you and your learning style, and you can assure me you will not become distracted (e.g., e-mail, browsing, social media, etc.) when using your device, I will be happy to consider this. Please just talk to me.

If you know ahead of time you will miss class for a valid reason (e.g., interview for graduate/medical school, competing in an intercollegiate athletic event, etc.), please notify me AT LEAST TWO WEEKS ahead of time. Alternative arrangements *may* be possible, but are not guaranteed. If you unexpectedly miss class for a valid reason (e.g., severe illness, family emergency, etc.), contact me as soon as possible; you may be asked to provide proof of absence (e.g., a doctor's note). Note that other travel plans (e.g., leaving PLNU early for Spring Break, Easter Break, or similar) DO NOT count as a valid reason to miss class and may not be accommodated.

I take academic integrity seriously and will not tolerate cheating or any other kind of dishonesty. Refer to the University's Academic Honesty Policy by clicking [here](#). Please be aware that many assignments will be submitted through Canvas and these will be automatically scanned by advanced plagiarism detection software against material published online and material submitted by other students (both current and past students).

Land Acknowledgement

I want to acknowledge that the land on which we gather is the traditional and unceded territory of the Kumeyaay Nation. I want to pay respect to the citizens of the Kumeyaay Nation, both past and present, and their continuing relationship to their ancestral lands.

Course Logistics Schedule and Tentative Guiding Questions (specifics about lecture and lab topics will be posted on Canvas and may deviate from the tentative questions below)

Day	Date	Topics Covered
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Week 1: What types of relationships occur in ecosystems?

TUE	1/10	LECTURE (this day operates on a Monday schedule)
WED	1/11	LECTURE
THU	1/12	LAB: Ecospheres
FRI	1/13	LECTURE

Week 2: What types of relationships occur in ecosystems?

MON	1/16	NO LECTURE – MARTIN LUTHER KING JR. DAY
WED	1/18	LECTURE
THU	1/19	LAB: Hiruna Reserve
FRI	1/20	LECTURE

Week 3: What types of relationships occur in ecosystems?

MON	1/23	LECTURE
WED	1/25	LECTURE
THU	1/26	LAB: Sunset Cliffs (<i>Note: Evening lab section should join either morning or afternoon</i>)
FRI	1/27	LECTURE

Week 4: What is biodiversity and how do we preserve it? What are genes and alleles? How do we use natural selection to explain natural phenomena?

MON 1/30 LECTURE
WED 2/1 LECTURE
THU 2/2 LAB: [Exam 1](#)
FRI 2/3 LECTURE

Week 5: How do populations grow? How does evolution occur?

MON 2/6 LECTURE
WED 2/8 LECTURE
THU 2/9 LAB: [EvoDots](#)
FRI 2/10 LECTURE

Week 6: What is the evidence for evolution? How do new species arise? How do scientists depict evolutionary relationships?

MON 2/13 LECTURE
WED 2/15 LECTURE
THU 2/16 LAB: [No meeting on Thursday; tide pool field trip moved to Saturday or Sunday](#)
FRI 2/17 LECTURE
SAT 2/18 LAB: [Tide Pools \(-1.77 feet at 2:20 pm\)](#)
SUN 2/19 LAB: [Tide Pools \(-1.78 feet at 2:57 pm\)](#)

Week 7: How does geography influence how organisms evolve? Are creation and evolution compatible?

MON 2/20 LECTURE
WED 2/22 LECTURE
THU 2/23 LAB: [Phylogenetics](#)
FRI 2/24 LECTURE

Week 8: What factors contribute to changes in gene frequencies within populations?

MON 2/27 LECTURE
WED 3/1 LECTURE
THU 3/2 LAB: [Exam 2](#)
FRI 3/3 LECTURE

No class this week – Spring Break

MON 3/6 *NO LECTURE – SPRING BREAK*
WED 3/8 *NO LECTURE – SPRING BREAK*
THU 3/9 *NO LAB – SPRING BREAK*
FRI 3/10 *NO LECTURE – SPRING BREAK*

Week 9: How do species interactions influence community stability?

MON 3/13 LECTURE
WED 3/15 LECTURE
THU 3/16 LAB: [Hardy-Weinberg](#)
FRI 3/17 LECTURE

Week 10: Why sex? How do species interact?

MON 3/20 LECTURE
WED 3/22 LECTURE
THU 3/23 LAB: [Lottia 1](#)
FRI 3/24 LECTURE

Week 11: How do species interact? What is radiometric dating?

MON 3/27 LECTURE
WED 3/29 LECTURE
THU 3/30 LAB: Lottia 2
FRI 3/31 LECTURE

Week 12: How are all animals related? Where did whales come from?

MON 4/3 LECTURE
WED 4/5 LECTURE: Exam 3
THU 4/6 NO LAB – EASTER BREAK
FRI 4/7 NO LECTURE – EASTER BREAK

Week 13: Where did whales come from?

MON 4/10 NO LECTURE – EASTER BREAK
WED 4/12 LECTURE
THU 4/13 LAB: Skulls 1
FRI 4/14 LECTURE

Week 14: How does the physical and biological environment affect organisms?

MON 4/17 LECTURE
WED 4/19 LECTURE
THU 4/20 LAB: Skulls 2
FRI 4/21 LECTURE

Week 15: What is the evidence for and implications of global climate change?

MON 4/24 LECTURE
WED 4/26 LECTURE
THU 4/27 LAB: Climate Change
FRI 4/28 LECTURE

Finals Week

FRI 5/5 Final Exam (cumulative), 1:30 – 4:00 PM, in lecture classroom (Latter Hall 01)

Assessments and Grading

Assessment	Percentage of Final Grade
Midterm Exam 1	10%
Midterm Exam 2	10%
Midterm Exam 3	10%
Final Exam	15%
Quizzes	15%
Miscellaneous Assignments	15%
Special Projects	5%
Lab Assignments and Reports	20%
Total	100%

(continued on next page)

The following scale will be used to determine your final course letter grade (students will receive the same grade for lecture and lab):

97.0% ≥	A+		77.0% ≥	C+	< 80.0%
93.0% ≥	A	< 97.0%	73.0% ≥	C	< 77.0%
90.0% ≥	A-	< 93.0%	70.0% ≥	C-	< 73.0%
87.0% ≥	B+	< 90.0%	67.0% ≥	D+	< 70.0%
83.0% ≥	B	< 87.0%	63.0% ≥	D	< 67.0%
80.0% ≥	B-	< 83.0%	60.0% ≥	D-	< 63.0%
				F	< 60.0%

Three Midterm Exams (10% each) and one Final Exam (15%): Students are expected to take the exams on the days scheduled unless they have a written excuse cleared by the instructors. If there is an approved conflict you will be expected to take the exam prior to the scheduled time. Missing an exam due to illness will require medical verification. Unexcused misses will result in a zero grade. You will have two weeks from the time exams are handed back to discuss possible corrections, after which the grade becomes permanent. Exams will cover all material assigned, including assigned chapters from “Origins.” In addition to the material that will be covered in lecture, each exam will include questions from material assigned but not discussed directly in class. This is intended to begin developing the skills necessary for independent learning. In extenuating circumstances, exams may be deployed using the Honorlock system in Canvas.

Quizzes (15%): Quizzes will cover both course content and reading material. One goal of the quizzes is to hold students accountable for assigned readings and online lectures. Most of the quizzes will be available on Canvas (online), others will be in class. You will be given fair notice and have an adequate window in which to complete the quiz. If taking the quiz online, no quizzes will be accepted after the time window has expired (so please do not ask for an exception). For online quizzes, you will generally have about 20 minutes to complete the quiz, you may not have discussions with other students, and they will be deployed using the Honorlock system in Canvas.

Miscellaneous Assignments (15%): There will be several different assignments that relate to the course material. All assignments will be listed on Canvas and you will be given fair notice as to when they are due.

Special Projects (5%): There will also be a reflection project assigned during the semester related to the intersection of faith and science (details forthcoming). You will also complete a service-learning project during the semester (details forthcoming).

Laboratory Assignments and Reports (20%): Various worksheets and reports will be assigned.

Students are expected turn in all assignments and reports on time. Late assignments will be accepted, but with a 20% penalty for each day (or fraction thereof) late, including weekends and holidays. Waiving the late penalty or granting an extension may be appropriate in certain circumstances; students should discuss their situation as soon as possible with the professor.

Students are required to attend all lecture and laboratory sessions. Students are allowed up to 3 unexcused absences (lecture absences count as 1 absence and laboratory absences count as 2 absences), without penalty. Each additional unexcused absence will result in a loss of 2 percentage points off the final course grade.

PLNU Institutional Policies

PLNU Mission: To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Foundational Explorations (formerly GE) Mission:

PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and culture.

State Authorization:

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on [State Authorization](#) to view which states allow online (distance education) outside of California.

PLNU Academic Honesty Policy:

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See [Academic Policies](#) for definitions of kinds of academic dishonesty and for further policy information.

PLNU Academic Accommodations Policy:

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center (EAC@pointloma.edu or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester. PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course. Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC. If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

PLNU Attendance and Participation Policy:

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation.

In some courses, a portion of the credit hour content will be delivered asynchronously and attendance will be determined by submitting the assignments by the posted due dates. See [Academic Policies](#) in the Undergraduate Academic Catalog. If absences exceed these limits but are due to university excused health issues, an exception will be granted. A day of attendance in asynchronous content is determined as contributing a substantive note, assignment, discussion, or submission by the posted due date. Failure to meet these standards will result in an absence for that day. Instructors will determine how many asynchronous attendance days are required each week.

Use of Technology:

In order to be successful in the online environment, you'll need to meet the minimum technology and system requirements; please refer to the [Technology and System Requirements](#) information. Additionally, students are required to have headphone speakers compatible with their computer available to use. If a student is in need of technological resources, please contact student-tech-request@pointloma.edu. Problems with technology do not relieve you of the responsibility of participating, turning in your assignments, or completing your class work.

PLNU Copyright Policy:

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU Final Examination Policy:

Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted in this syllabus on the following pages. No requests for early examinations or alternative days will be approved unless you have 3 final exams scheduled on the same day or another compelling reason.

Spiritual Care:

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith. If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the [Office of Spiritual Development](#).